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Use of animals in the health management of elephants in medieval period of Assam, India

Rasna Rajkhowa[1] · **Bipul Ch. Saikia**[2]

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Abstract
There was a tradition of catching, taming and training elephants in medieval Assam for warfare, transportation, carrying loads etc. Many manuscripts known as the *hatiputhi* in Assamese language recorded a lot of information about capture, training and treatment of various diseases of elephants. Unfortunately, most of these manuscripts were destroyed or lost due to various reasons. We managed to collect digital versions of four unpublished manuscripts from four different places of Assam written in the old Assamese language using *kaitheli* script, a common script prevalent at that time. The manuscripts transliterated from *kaitheli* to modern Assamese script reveal a large number of traditionally used medicines to treat various diseases of elephants. These *hatiputhi* manuscripts mention the use of 61 ethnozoological animals alone with treatment methods for 21 diseases and deficiencies of elephants.

Keywords Diseases · Elephant · Ethnozoology · *Hatiputh* · Treatment

1 Introduction

The practice of elephant capturing, taming and treatment is very old in Assam. The epic *Mahābhārata* tells us about a large elephant of the King of Pragjyotishpur (ancient name of Assam). It is said that the *āśrama* of sage Pālakāpya, author of *Hastāyurveda*, a treatise on elephants, was situated on the bank of river Lauhitya of Assam, now known as the Brahmaputra (Saikia & Bordoloi, 2015, p. 159). The Chinese pilgrim Yuan Chwang, mentioned in his travelogue about the practice of elephant keeping by the early rulers of Assam (Beal, 1884). The *Arthaśāstra* of Kauṭilya and the *Raghuvaṁsa* of Kālidāsa mention about the practices of keeping large number of elephants by the early rulers of Assam.

In 1228 CE, a group of people from Southern China belonging to the Shan tribe entered the Brahmaputra valley of Assam under the leadership of prince Sukapha and established a new kingdom in the valley. Later, these Shan people comingled with the local tribes to form the Ahom tribe. The Shan people had a tradition of taming and using elephants for various purposes in the Shan plateau of their land of origin. It is noteworthy that these people even used elephants for ploughing paddy fields (Shepherd & Nijman, 2008, p. 3). Prince Sukapha brought a small contingent of elephants with him (Bhuyan, 1990, p. 5). Thus Assam became a melting pot of different traditional elephant lores from several distinct cultures. Historian Shihabuddin Talish who accompanied Mir Jhumla in his invasion of Assam during the middle of the seventeenth century CE mentions about large number of elephants abounding in the hilly regions and forests of Assam. He highly praised the elephant capturing skill and management of the people of this land (Asif, 2009, p. 45).

During Ahom rule, tribal group, known as the Morans developed their special expertise in elephant capturing, taming and treatment (Moran, 2007, pp. 250–258). As the early rulers and the Ahom kings of the pre-Ahom era kept large number of elephants for defense purposes, a traditional science for taking care of these animals started developing. This traditional knowledge of taking care of elephants was documented in the form of several manuscripts, popularly known as *hatiputhi* (elephant manuscript). Unfortunately most of such manuscripts were destroyed during "Mowamoriya Revolution" and Burmese invasion. The most popular *hatiputhi*, known as *Hastividyārṇava* is already published (Borkaith,

✉ Rasna Rajkhowa
rasna.rajkhowa@gmail.com

[1] Departmemt of Physics, T. H. B. College, Jamugurihat, Sonitpur, Assam 784189, India

[2] Departmemt of Chemistry, T. H. B. College, Jamugurihat, Sonitpur, Assam 784189, India

1734). But there are several other *hatiputhi* manuscripts which are preserved in different parts of Assam. We have found a total of four copies of unpublished manuscripts of different *hatiputhis* in Assam. Surprisingly, three of the manuscripts have the same common title name '*Gajendra Cintāmaṇi*'. The most important and precious observation about these manuscripts is that they provide the traditional method of treatment for a variety of diseases of elephants (Rajkhowa, 2021). They mention the use of different medicines extracted from plants and animals for the treatment of various diseases like ingestion of soil, worm trouble, diarrhea, dysentery, wounds, scabies, obesity, and medicines for making them healthy, to increase sharp wittedness, temporin or ruttish water of elephants and so on.

It is to be noted that the use of animals and animal products for therapeutic purposes were in practice in ancient India. The *Caraka Saṁhitā* (Sharma, 1998), the well-known Hindu text on Ayurveda (life sciences), frequently mentions the use of cow dung, milk and urine of cow, goat, flesh and bones of fishes, cat, dog etc. in the treatment of different diseases. Thus, it is not a surprising fact that the above mentioned *hatiputhis* include several such animal species and animal products in the treatment of various diseases of elephant. While comparing the treatment methods for some of the diseases prescribed in *Gajendra Cintāmaṇi* and *Caraka Saṁhitā*, we found that both the manuscripts mention the use of body parts, blood, faeces and urine of different species which include cock, cow, peacock, swan, buffalo, sparrow, deer, rabbit, dove, pigeon, quail, common quail, horse, bull, spotted deer, fishes, boar, bees, dog, cat, camel, goat, vulture, owl, fox, mongoose, cat, jackal, hyena, lion, bear, tiger, ass, porcupine, wolf, ants, iguana, tortoise, pangolin, elephant, snakes, crocodile and so on. However, the uses of these species are different in both the manuscripts for a given ailment.

2 Methodology

We collected four different digitized copies of unpublished *hatiputhi* manuscripts presently available in Assam. None of these manuscripts are found to be complete in respect of their number of folios. These manuscripts have been collected from J. B. College Library of Jorhat district, Auniati Satra of Majuli, Titabor of Jorhat district and Gharmora Satra of Lakhimpur district of Assam (Figs. 1, 2, 3 and 4). These manuscripts are written in the *kaitheli,* an ancient script of Assamese

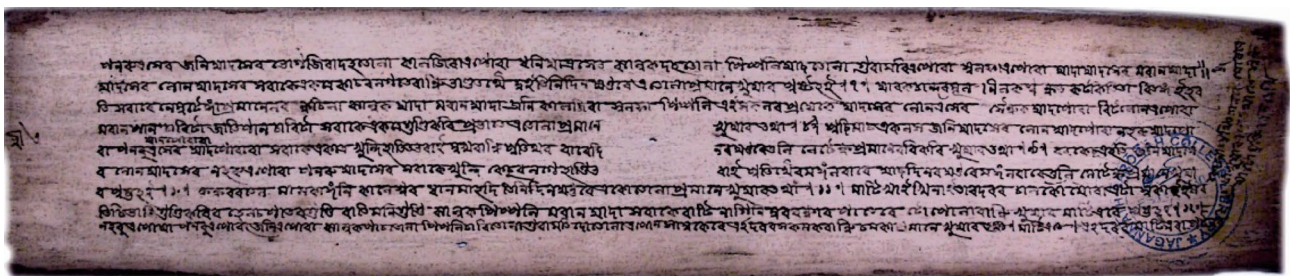

Fig. 1 A folio of the manuscript preserved in J. B. College, Jorhat, Assam

Fig. 2 A foil of the manuscript preserved in Auniati Satra, Majuli, Assam

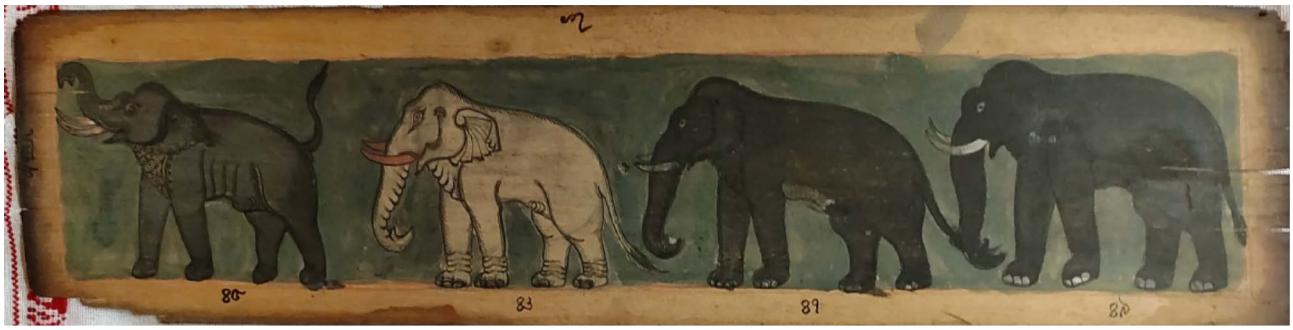

Fig. 3 A folio of the manuscript preserved in private collection in Titabar, Jorhat, Assam

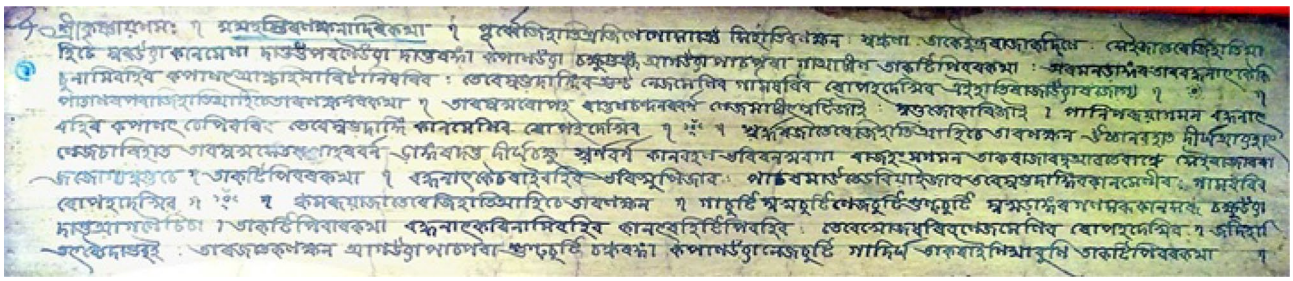

Fig. 4 A folio of the manuscript preserved in Gharmora Satra, Lakhimpur, Assam

Table 1 Details of the four collected *hatiputhi* manuscripts

Title of *Hatiputhi*	*Gajendra Cintāmaṇi*	*Gajendra Cintāmaṇi*	Not mentioned	*Gajendra Cintāmaṇi*
Author	Sambhunath	Prithuram	Not mentioned	Not mentioned
Time period	Not known	1778 CE	Not known	Not known
Place of collection	Auniati Satra Museum, Assam	Jagannath Barooah College Library, Assam	Personal preservation, (belonging to Mr.Suresh Rajkhowa), Titabor, Assam	Gharmora Satra, Assam
Number of folios/pages	166/332	64/137	76/152	7/14
Script	*Kaitheli*	*Kaitheli*	*Kaitheli*	*Kaitheli*
Language	Ancient Assamese	Ancient Assamese	Ancient Assamese	Ancient Assamese
Size	55 × 16 cm	43 × 10 cm	42 × 10 cm	34.5 × 10 cm
Surface	Sanchipat	Sanchipat	Sanchipat	Sanchipat
Registration	Registered	Not registered	Registered	Registered
No. of folios containing pictures	286	Nil	15	Nil

language. Being well acquinted with both *kaitheli* and modern Assamese scripts, we at first, transliterated all these manuscripts from *kaitheli* to modern Assamese. This transliteration work from *kaitheli* to modern Assamese was examined and verified by two scholars Mr. Golok Shastri, retired *adhyāpaka* of Jamugurihat Sanskrit Tol and Mr. Bhaskar Bordoloi, Tezpur, Sonitpur Assam who are well versed with ancient *kaitheli* script. The ambiguous texts presented in the manuscripts are deciphered by examining the similarities and dissimilarities of the passages present in the same and different contexts in the manuscripts. Finally, by comparing the four manuscripts with each other, we have compiled a nearly complete one single manuscript in Assamese scripts. After completeion of this, we have translated the whole manuscripts into English. Data on different diseases and treatment methods mentioned in the menuscripts are collected and analyzed to arrive at the findings.

The collected *hatiputhis* have been found to be of different sizes and they are written on *sanchipat* (a writing media prepared from the bark of the tree *Aquilaria agallocha*). Two of them have been found to be authored by two different persons while the other two do not mention

Table 2 Animal/Animal body parts/products used in the treatment of diseases of elephants mentioned in the *hatiputhis*

Sl. no.	Disease/defficiency	Medicinal preparation prescribed	Animal/animal body parts/products involved	Folio no. of *Hatiputhi*
1	Gastritis	A mixture consisting of heart-leaved moonseed creeper, giant potato, Indian gamboge fruit, black cow's dung, red leadwort, turmeric and leaves of Indian spurge tree mixed with liquor is to be fed	Black cow's dung	GC (G)-64
2	Loss of appetite	A cobra cut off the tail of one fist of length is placed in a pot along with two handfuls of a big variety of black pulses, one handful each of black and white cumin seeds, one handful of the pounded bits of the roots of madan-mast tree. The serpent-bones are thrown away from the content and being dried up in the sun after 20 days and placed again in the pot, with liquor added to it for 3 days and again dried for 3 days and then it is given to increase hunger, the elephant should not to be allowed to sleep during the treatment period	Cobra	GC(A)-157
		A preparation consisting of the meat of a fair-bodied deer, liver of a black hen, bile and liver of a house crow, taro, ear of a dwarf elephant, eel, barks of false guava, sweet potato, all mixed up and is fed during the autumn months	Meat of deer, liver of black-coloured hen, bile and liver of house crow, ear of an elephant	GC (J) -55
3	Worms trouble	A burnt tortoise every morning is to be fed to cure	Tortoise	GC (J)-43
		A preparation consisting of the roots of jute plant, intestine and bile of porcupine, root of thatch grass, leaves of Indian spurge tree, root of Indian crocus, bile of *rohu* fish is fed	Intestine and bile of porcupine, bile of *rohu* fish	GC (J)-43
4	Stomach disease	A preparation of the barks of golden shower tree and *neem*, along with the bile of an Indian python, a tortoise, a frog and the roots of cluster fig, creeping cucumber, bark of devil tree, giant potato and leopard lily, all dried and grinded, mixed with *ahu* rice and grass is fed	Bile of Indian python, tortoise, frog	GC(A)-157
5	Habit of taking soil	The flesh and bones of boar cut in to small pieces are to be put in a pitcher. The roots of water lily, pomegranate, hog plum and black cumin, coriander, ajwain seeds, white cumin seeds, borax are to be mixed with the flesh and be kept until they decompose. When done, the content should be mixed with liquor and be fed for 2–4 days	Flesh and bones of boar	GC(G)-7, GC(J)- 38
		A basketful of intestine of rohu fish, rice powder, one fourth of a *seer* of each of ajwain seeds, fennel seeds, coriander seeds, one *seer* of each of powder of nongmangkha, powder of fried black bora rice, put in a pitcher, when the contents get decomposed, is to be fed in a little bit in the early morning	Intestine of rohu fish	GC(A)-155
		Four basketful of dwarf barb fish put in a pitcher, added one *seer* pounded of each of spiral nightshade with leaves and seeds, black and white nongmangkha, one *seer* of root of water lily, half a *seer* of each of turmeric, black turmeric, Indian henna leaves, basil leaves, one *seer* of powder of narrow leaf morinda wood, one *seer* of salt, all together, three layer of dwarf barb fishes, three layer of pounded medicine kept for twenty one days is to be fed every morning	Swamp barb fish	GC(A)-156
		Roots of black and white nongmangkha (*Phlogacanthus jenkinsii*), forest bitterberry, tender leaves of creeper, leaves of spiral nightshade, chaste tree, all grinded together and put in a pitcher and mixed with urine of baby boy and black cow are to be applied until the medicine decomposes. When decomposed, it is to be fed in the morning	Urine of human, black cow	GC(J)-39
		Stool of boar is to be fed	Boar	GC(J)-40
		Leaves of nongmangkha (*Phlogacanthus jenkinsii*), forest bitterberry, Indian liliac, green chireta, root of thatch grass, tender leaves of creeper, root of hemp, common rat tan, asparagus, twenty eel fishes, salt, black pepper, long pepper, added boiled meat of five pied myna bird	Eel, pied myna bird	
		Liver of squirrel, hair of widow of three houses, seed of each of spiral nightshade, added salt, oil, garlic, black cumin, long pepper are pounded together and is to be fed	Liver of squirrel, human hair	GC(J)-45

Table 2 (continued)

Sl. no.	Disease/defficiency	Medicinal preparation prescribed	Animal/animal body parts/products involved	Folio no. of *Hatiputhi*
		A large amount of earthworm is to be kept with salt for 3 days. After 3 days, it is to be cleaned of earth by washing and rinsed. The content should be boiled until water evaporates, not to add water as the content yields water. Salt and oil are to be added along with garlic, onion and turmeric. The mixture should be fed daily in the morning in the proportion of one *tola*	Earthworm	GC(J)-45
		The flesh of snail is to be fried in oil with rice, one and one fourth *seer* of powder of fried rice, one eighth of a *seer* of ajwain, one and one eighth of a *seer* of onion, one and three eighth of a *seer* of salt and to be put in a covered container and the whole content should be fed in the proportion of two *tolas* in the morning	Flesh of snail	GC(J)-49
		A pounded and burnt up mouse, stool and hairs of a boar, salt, black pepper, long pepper, nitre and sulphur, all grinded, is fed on every alternate day for 21 days	Mouse, Boar	GC(J)-50
		Frog, black and white cumin, ajwain, poppy, eel, salt, bitter cucumber and the two varieties of *neem*, big and small, ginger, all put in a new pitcher for 15 days and is fed	Frog, eel	GC(J)-50
		Bile each of hen, crows, *rohu* fish mixed with rice cut grass, fuzzy flatsedge and forty swamp barb fishes, all put in a new pitcher for 3 days and the content being allowed to decompose and put in the sun for drying for 2 days and is fed along with grass for 3 days	Bile of hen, crow, rohu fish, swamp barb fish	GC(J)-50
6	Eye disease	A mixture of honey, milk of goat, red sandal is applied on the eyes of the elephant	Goat's milk	GC(A)-162, GC(J)-50
		A pitcher of elephant foot yam, Skunk vine, a handful of leaves of gigantic swallow wort, a pitcher of sacred barna, a busket of faeces of buffalo, a busket of termite soil, a pitcher of leaves of Indian spurge tree, seeds of *datura*, a jar of cow's urine, a *seer* of salt are crushed together and boiled with a quarter *seer* of nitre and is applied while warm on the eyes	Buffalo, cow	GC(A)-162, GC(J)-50
		Lemon, oil, curry of eel, green tree ant, coriander and black salt – all these are mixed and packets are made. This is applied on the eyes of the elephant after it is bathed and allowed to eat alternate days	Green tree ant	GC(A)-166 GC(J)-57
		Powdered barks of Nongmangkha (*Phlogacanthus jenkinsii*) tree and roots of monkey ladder tree are mixed with the fats of a barren boar and the mixture is applied on the eyes of the elephant suffering from cataract	Fats of boar	GC(A)-166 GC(J)-58
7	Sores in the nails and soles	Barks of *pipal* tree, jack fruit tree, pomegranate tree, charcoal of stone wood tree, broken old *ahu* paddy, leaves of Himalayan fan palm, bark of jackfruit tree, powder of steel, bone of wooly-necked stork, Indian tent turtle – all these are taken in equal proportions and grounded and fried to get ashes and applied	Bones of wooly-necked stork, Indian tent turtle	GC(G)-6, GC(J)-43, GC(A)-167
8	Cough	Liver of black cat, juice of ink weed, black cumin powder, all mixed in equal proportion and grinded, is to be fed with old molasses in equal amount	Liver of black-coloured cat	GC(J)-57
9	Ear disease	A preparation consisting of long pepper, black pepper, black cumin, boiled with *ahu* rice, adding six times the quantity of water and mixed with ghee, churned milk and boiled gravy of bear's meat is to be applied on the ears	Meat of bear	GC(A)-161, GC(J)-57
10	Sleeplessn-ess	Black carpenter ant along with a ripe plantain of a big variety is fed	Black carpenter ant	GC(A)-163, GC(J)-55
11	Scabies	A basketful of flesh of snail, half a *seer* of ajwain seeds, fried and added cow's milk; put in a pot with cover and kept underground for 8 days and is fed in the proportion of size of lemon	Snail, Cow	GC(G)-64, GC(A)-159, GC(J)-43
12	Flow of pus from the vital parts and other diseases	An elephant, suffering from boils, vomiting of blood and passing of blood with urine can be cured by feeding it with a preparation of ginger juice, long pepper, grapes, sugar, milk, gravy of goat's meat, all mixed up in equal proportions	Meat of goat	GC(A)-159, GC(J)-55
13	Medicines for developing swimming ability	One hundred and one seeds of black pepper, put in the bile of a tiger are grinded and pasted on the upper palate of the elephant. Again the quantity of seed is put in the bile of a *rohu* fish and grinded and mixed with the ear-wax of the rider. The mixture is applied in the eyes of the elephant	Biles of tiger, rohu fish, human ear-wax	GC(A)-163, GC(J)-61
14	To control rutting stage	A preparation made by burning a combination of common house gecko, jackfruits seeds and hornet on a Saturday and mixed with salt and ajwain seeds is fed	Common house gecko, hornet	GC(A)-164,165 GC(J)-63

Table 2 (continued)

Sl. no.	Disease/defficiency	Medicinal preparation prescribed	Animal/animal body parts/products involved	Folio no. of *Hatiputhi*
15	To make elephants stout and healthy	The bile and liver of an elephant, bile of a horse, bile and head of jackal, one vulture, and twenty-one seeds of beleric myrobalans, are put in a pot and kept underground, being dug out after 50 days and then put in the sun for 9 days, mixed again with a quarter *seer* of black and white cumin, twenty pieces each of datura and nut-meg, clove, stool of monkey, mixed with hemp and five pot-full of rice-beer and the mixture is fed for 21 days	Bile and liver of an elephant, bile of a horse, bile and head of a jackal, vulture, stool of monkey	GC(A)-152, GC(J)-37
		A mixture of dried up jute plants, oil, salt, long pepper, nutmeg, fenugreek seeds, ink-weed, head of a black cat burnt up and its teeth removed, all put in a pitcher on one Friday and served on the next day, continued for 21 days	Head of a black cat	GC(A)-152, GC(J)-37
		The ruttish water of an elephant put in a big pot along with a mouse and the genital organ of a tiger and a bear and is rubbed with the said water on a Tuesday	Mouse, genital organ of a tiger and a bear	GC(A)-152, GC(J)-37
		The elephant is rubbed in its temples with its ruttish water emit-ting bad odour. The ruttish water is mixed with the ingredients, consisting of the flesh, testicles and bile each of a tiger that crosses a river and a he-bear and a mouse, all being pounded and is done likewise on a Tuesday	Ruttish water, flesh, testicles and bile of tiger, he-bear, mouse	GC(A)-153, GC(J)-37
		An elephant is fed and also its head rubbed with ingredients consist-ing of rice-beer, head of a monocle cobra, elephants' stool and a mouse, so as to make it bring successes in warfare	Head of monocle cobra, elephant dung, mouse	GC(A)-153
		Ingredients consisting of the flesh, blood and bile each of an Indian roofed turtle, a mongoose, a black cat, a jackal, a deer, a chame-leon, a black drongo bird, a monkey, a vulture, an owl, a hen, all mixed with white butterfly pea, small warty acampe, snake fern flower, salt, ajwain, white and black cumin and coriander seeds, all boiled in a pot and then mixed with the leaves of sugarcane and is fed	The flesh, blood and bile Indian roofed turtle, mongoose, black cat, jackal, deer, chameleon, black drongo bird, monkey, vulture, owl, hen	GC(A)-154, GC(J)-48
		A ball prepared by mixing first a mouse and a lizard, boiled and their juice put in a pot with a cover, for 7 days and then mixed with water mimosa, spiral nightshade, roots of screw pine flower, dried barks of spiny sida tree, ajwain seeds, black and white cumin seeds, all grinded and then mixed with juice of common cocklebur and is fed in the morning	Mouse, lizard	GC(A)-154, GC(J)-48
		Ingredients consisting of the skin of a small variety of Indian cobra and of a black man, mixed with dwarf barb fishes, rice-beer, seeds of jute plant pounded bits of wheat, all grinded, fed in the propor-tion of two *tolas*, one and half a *tola*, and one *tola* each to a big, medium and a small elephant respectively	Skins of Indian cobra, black man, dwarf barb fish	GC(A)-154, GC(J)-48
		Ingredients consisting of the ashes of a burnt up black male cat, mixed with the fat of a buffallo, skin of a big bat, along with the leaves of gigantic shallow wort, nutmeg, one *tola* each of clove, black cumin and of white cumin seeds, two *tolas* of burnt up kuria labeo fish, two *tolas* each of ajwain seeds and bitter cucumber, five eels is to be fed	Black male cat, fat of buffalo, skin of bat, kuria labeo fish, eel	GC(J)-48
		Three roots and barks of Indian trumpet tree, flesh of three hens, tiger's milk, gourd, liquor, mixed in equal proportion, along with a piece of sugarcane is to be fed	Hen, milk of tiger	GC(A)-154
		Four *kauns* of snail are to be gathered. Eighty pieces of this are to be boiled to get the flesh. This is fried in oil in the evening, mixed with salt, five pieces of garlic and onion and is to be fed in the next morning	Snail	GC(J)- 48
16	To increase ruttish water	A pitcher of dwarf barb fishes, half *seer* of ajwain seeds, one eighth *seer* of salt, one eighth *seer* of garlic, one and one eighth *seer* of onion, grinded all together and put in a pot kept underground with a cover for 12 days and to be given in the size of Burmese grape fruit	Dwarf barb fish	GC(A)-150
		Ingredients consisting of half *seer* of ajwain seeds, half *seer* of salt, one fourth *seer* of garlic, one fourth *seer* of onion—all grinded and mixed with earthworm, put in a pot and kept underground on Tuesday for 8 days, to be given in a size of Burmese grape fruit	Earthworm	GC(A)-150

Table 2 (continued)

Sl. no.	Disease/defficiency	Medicinal preparation prescribed	Animal/animal body parts/products involved	Folio no. of *Hatiputhi*
		Ingredients consisting of fats of dog, paddy and pulses are given a *tola* in the interval of 3 days	Fats of dog	GC(A)-151
		A ball prepared by boiling the flesh of a hen without skin along with soot, rice and liquor in oil and then dried up in sun is fed	Flesh of hen	GC(A)-151
		A ball in the morning prepared with the ingredients, consisting of the flesh of otter, the flesh of giant snakehead fish, and swamp barb fish, both boiled and mixed with black peeper, long pepper, salt, black and white cumin, ajwain, onion, coriander seeds; and no water to be added and is fed	Otter, giant snakehead fish, swamp barb fish	GC(J)-51
		Boiled ingredients of the burnt frog, mixed with slender amaranth is to be fed in the morning	Frog	GC(J)-51
		Meat of a big variety of crows, hens, grass-owls, mongooses and monkeys, all boiled and mixed with honey and is fed	Meats of crow, hen, grass-owl, mongoose, monkey	GC(J)-52
		The roots and branches of leopard lily flower, a dove and ink weed, all mixed up and is fed	Dove	GC(J)-52
17	Making the elephants, rutted and strong	The two varieties of crows, male black-shouldered kite, owls, mongooses and monkeys, all boiled and mixed with honey and is fed	Crow, male black-shouldered kite, owl, mongoose, monkey	GC(A)-148, GC(J)-47
		Five giant hornets, five great golden digger wasp, mixed with salt and is applied on the path of ruttish water and is fed	Hornet, golden digger wasp	GC(A)-148, GC(J)-47
		A mixture of pounded heads of five male human, five heads and fleshes of cobra, one *buri* of nutmeg, ten *toka* of clove, one fourth *seer* of hemp, seven pieces of rice beer cakes, all together with a pitcher of rice beer if to be fed	Human, cobra	GC(A)-149, GC(J)-47
		A cobra covered by paddy and then boiled and the paddy is fed	Cobra	GC(A)-149, GC(J)-49
		Ingredients consisting of Assam indigo, vine spinach, flesh, blood and bile each of a tortoise, a mongoose, a black cat, a jackal, a Indian pangolin, a Indian chameleon, a black drongo bird, a monkey, a vulture, an owl, a cock, all mixed with stinging nettle, monkey jackfruit, bat, ajwain, white and black cumin and coriander, added three part of water, all boiled in a pot, when water reduced to one part and half part of rice bear is added and fed	Tortoise, mongoose, black cat, jackal, Indian pangolin, Indian chameleon, black drongo bird, monkey, vulture, owl, cock, bat	GC(A)-149, GC(J)-49
		Ingredients consisting of cockroach, flowers of bullet wood, a big variety of otter, roots of vine spinach and sandal tree, all grinded and mixed in equal quantities with coconut-water, cow's milk, honey, and then boiled and pounded again, the ingredients being dried up in the sun, and a two pellets of all these are allowed to eat with a piece of sugarcane on the first day of the moon, increasing the proportion to the four pellets on the next day and to eight pellets for the following day	Cockroach, otter, cow's milk	GC(A)-150, GC(J)-51
		Swamp barb fishes roasted in ghee is fed for 3 days. The skin of a deer along with ajwain and black cumin seeds for 3 days is also given. Thereafter the elephant should be given gourds and betel-vines in large quantities to eat	Swamp barb fish, deer	GC(A)-150, GC(J)-51
		A big variety of swamp barb fish, fried in ghee, along with molasses is fed for 3 days in the morning	Swamp barb fish	GC(A)-151
18	To make hot-tempered and restless elephants calm and quiet	Water from a big variety of garden snail along with its flesh is extracted and fried in oil, mixed with garlic, onion, ajwain seeds, coriander seeds and salt, all pounded and is fed every morning in little quantities	Garden snail	GC(A)-159, GC(J)-52
		The head of a dead Asian elephant is pounded and mixed with liquor and put in a pot of water and heated. Nine cluster fig fruits collected from the same petiole are mixed to it and the mixture is to be pounded and boiled with rice and be fed with leaves of sugarcane	Asian elephant	GC(A)-159, GC(J)-52
		Salt and black pepper from the same hill are put inside a spotted snakehead fish through the mouth and cooked by burning. The content is cleaned and added to packets of grass and fed	Spotted snakehead	GC(A)-159, GC(J)-52
19	To make elephants sharp-witted	A pounded mixture of the head of a millipede, Indian chameleon and white grub is fed through the mouth on Tuesday before bathing the elephant	Millipede, Indian chameleon, White grub	GC(A)-152, GC(J)-46
20	To provoke elephants to fight in the battle-field	Bile of tiger, Indian cobra, he-hen and bear are pounded and fed with leaves of sugarcane to provoke the elephant to fight in the battle fields	Bile of tiger, Indian cobra, hen, bear	GC(A)-155, GC(J)-46

Table 2 (continued)

Sl. no.	Disease/defficiency	Medicinal preparation prescribed	Animal/animal body parts/products involved	Folio no. of *Hatiputhi*
		A preparation of mixture of heartleaf, lower ruttish water, upper ruttish water, bile of fox should be grounded and applied on the body	Ruttish water of elephant, bile of fox	GC(A)-155, GC(J)-46
		Teeth of boar, peacock ocelli, frontal piece of Indian chaca fish are ground in the evening of Tuesday and put in the pointed rod used by the rider to control the elephant	Teeth of boar, peacock ocelli, frontal pieces of Indian chaca fish	GC(A)-155, GC(J)-52
		Horns of cow, meat of goat, she-deer, common swan, egg of crow, tortoise are ground together and put in the pointed rod used by the rider to control the elephant in the evening of Monday	Horn of cow, meat of goat, deer, common swan, egg of crow, tortoise	GC(J)-53
		A pounded mixture of black nightshade, Indian gamboge fruit, hornets, forest black pepper and long pepper roots is to fed with liquor	Hornets	GC(J)-62
21	Common ailments	A ball prepared by boiling together a common raven, house crow, booted hawk-eagle, grass owl, mongoose, monkey and mixed with seeds of Assam indigo, heart-leaved moonseed, Indian gooseberry, yellow pea, root of common jasmine, forest brinjal, powder of green gram, one *seer* of each of turmeric powder, sweet cane, sesame, three *seers* of *triphala* and is fed	Common raven, house crow, booted hawk-eagle, grass owl, mongoose, monkey	GC(A)-163, GC(J)-60

the name of author. All the available information about the *hatiputhis* is listed in Table 1.

2.1 Elephant treatment and care discussed in the manuscripts

The most important observations of the manuscripts even in the present time are that they provide the traditional methods of treatment for a variety of diseases of elephants. They mentioned the use of different medicines extracted from plants and animals for the treatment of various ailments like ingestion of soil, worm troubles, stomach troubles, wounds, scabies, and medicines for promoting the health of the elephants and so on. The manuscripts mention several diseases and deficiencies found in elephants. We have identified some traits which were desired to develop some special characters in the tamed elephants like increasing the sharp-wittedness, ability to swim and so on. We have selected only seventeen diseases that occur in elephants and four special traits in which elephants are trained as described and prescribed in the *hatiputhis.* Surprisingly, it has been learnt from the manuscripts that even human blood and heads were also used in the treatment of elephants. It is to be noted that the folios of *Gajendra Cintāmaṇi* collected from Titabor do not contain any treatment method for diseases of elephants.

In Table 2, we have listed the diseases and deficiencies, their treatment methods and animals, body parts and products as mentioned in these manuscripts. The manuscripts collected from Jorhat, Aauniati Satra and Gharmora are being referred here as GC (J), GC (A), and GC (G) respectively for convenience.

In Table 3, we have listed the names of the fauna mentioned in the four manuscripts written about 250 years ago as medicines for various diseases of elephants and prepared scientific notes on the identified fauna used as medicine. Local, common and scientific names, family of fauna and their classes are given in the list. These animals are identified after consulting different works on faunas (Ahmed et al., 2009; Alves & Rosa, 2013; Betlu, 2013; Borah & Prasad, 2016; Kakoti et al., 2006; Paul, 2018; Sarkar et al., 2014; Verma et al., 2014).

The fauna are arranged in alphabetical order of their local names (in Assamese language), followed by their common names, scientific names, family along with classes.

In this study, we have identified a total of 61 animal species used for treating 21 different diseases and deficiencies suffered by the elephants. The identified animals belong to various classes, viz., 21 to Mammalia, 14 to Aves, 8 belong to each of Reptilia and Insecta, 6 to Actinopterygii, 2 to Gastropoda and 1 each to Clitellata and Diplopoda. These data are represented in Table 4. We observe that mammals were the most commonly (34%) used class of animals, followed by birds (23%) and reptiles and insects (both 13%). This is represented with the help of pie diagram in Fig. 5.

2.2 Units and measurements

The units mentioned in the description of the treatment methods prescribed in the *hatiputhis* were prevalent in medieval Assam. The present equivalences of these units (Rajkhowa, 2021) are given below:

1 *tola* = 11.6464 g
1 *seer* = 936 g (approx)
1 *kaun* = 1280 pieces
1 *pitcher* = 7 l (approx)

Table 3 Identification of animals used in the treatment of elephants mentioned in the *Hatiputhis*

Sl. no.	Local name of the animal	Common name	Scientific name/family	Class
1	Ajagar/Dheki sap	Indian python	*Python molurus*/pythonidae	Reptilia
2	Amroli parua	Green tree ant	*Oecphylla smaragdina*/formicidae	Insecta
3	Banar	Monkey	*Macaca mulatta*/cercopithecidae	Mammalia
4	Bonrou	Indian pangolin	*Manis crassicaudata*/manidae	Mammalia
5	Bor beng	Frog	*Hoplobatrachus crassus*/dicroglossidae	Insecta
6	Baduli/Bor baduli	Bat	*Pteropus giganteus*/pteropodidae	Mammalia
7	Bor kudu	The Asian giant hornet	*Vespa mandarinia*/vespidae	Insecta
8	Birali/Mekuri	Cat	*Felis catus*/felidae	Mammalia
9	Bunda kesu	Earthworm	*Metaphire houletti*/megascolecidae	Clitellata
10	Bagh	Tiger	*Panthera tigris*/felidae	Mammalia
11	Bora gahari	Boar	*Sus scrofa*/suidae	Mammalia
12	Bor haladhia baral	Great golden digger wasp	*Sphex ichneumoneus*/sphecidae	Insecta
13	Bor kereluwa	Red legged fire millipede	*Aphistogoniulus corallipes/*pachybolidae	Diplopoda
14	Bhaluk	Bear	*Melursus ursinus*/ursidae	Mammalia
15	Chila	Male black-shouldered kite	*Elanus caeruleus*/accipitridae	Aves
16	Cuchia	Eel	*Amphipnous cuchia/*synbranchidae	Actinopterygii
17	Dhamana Sap	Spectacled cobra or binocellate cobra/ monocled cobra	*Naja kaouthia/elapidae*	Reptilia
18	Dhunda kak	Common Raven	*Corvus corax*/corvidae	Aves
19	Dura kach	Indian roofed turtle	*Pangshura tecta*/geoemydidae	Reptilia
20	Fesa	Owl	*Otus spilocephalus*/striggidae	Aves
21	Fetigum sap	Indian Cobra	*Naja naja*/elapidae	Reptilia
22	Fenshu sarai	Black Drongo	*Dicrurus macrocercus*/dicruridae	Aves
23	Fingur/Feura /Sial	Jackal, Fox	*Vulpes bengalensis*/canidae	Mammalia
24	Garu	Cow	*Bos indicus*/bovidae	Mammalia
25	Gridhar/Sagun	Vulture	*Gyps indicus*/accipitridae	Aves
26	Goroimach	Green Snakehead, Spotted Snakehead	*Channa punctata*/channidae	Aves
27	Ghura	Horse	*Equus caballus*/equidae	Mammalia
28	Sal mach	Giant snakehead	*Channa micropeltes*/channidae	Actinopterygii
29	Hati puk	White grub beetle	*Lepidiota Mansueta*/scarabaeidae	Insecta
30	Hati	Asian Elephant	*Elephas maximus*/elephantidae	Mammalia
31	Harina/Pahu	Deer	*Rucervus duvaucelii*/carvidae	Mammalia
32	Jethi	Common House Gecko	*Hemidactylus frenatus*/gekkonidae	Reptilia
33	Kach	Tortoise	*Nilssonia nigricans*/trionychidae	Reptilia
34	Kukur	Dog	*Canis familiaris*/canidae	Mammalia
35	Kaurakauria mach	Indian chaca	*Chaca chaca*/chacidae	Actinopterygii
36	Kurhi mach	Kuria Labeo	*Labeo gonius*/cyprinidae	Actinopterygii
37	Kukura	Hen	*Gallus domesticus*/phasianidae	Aves
38	Kankuria sarai	Asian Pied Starling, Pied myna	*Stumus contra*/sturnidae	Aves
39	Kapau	Dove	*Steptopelia chinensis*/columbidae	Aves
40	Kudu	Hornet	*Vespa affinis/vespidae*	*Insecta*
41	Kuruwa	Booted hawk-eagle	*Hieraaetus pennatus*/accipitridae	Aves
42	Kuwa/Pati kak	House crow	*Corvus splendens/corvidae*	*Aves*
43	Kandoni parua/kakuni paruwa	Black carpenter ant	*Camponotus pennsylvanicus*/formicidae	Insecta
44	Krukalas/Krikalas/Jethi /Tejpia	Indian chameleon	*Chamaeleo zeylanicus*/chamaeleonidae	Reptilia
45	Kumjeluka	Snail	*Crypotozona bistrialis*/ariophantidae	Gastropoda
46	Kerketuwa	Squirrel	*Sciurus caroliniensis* /Sciuridae	Mammalia
47	Ketela pohu	Porcupine	*Hystrix indica*/Hystricidae	Mammalia
48	Lai samuk/samuk	Garden snail	*Cornu aspersum*/helicidae	Gastropoda
49	Moh	Buffalo	*Bubalus bubalis*/bovidae	Mammalia
50	Mayur	Indian Peafowl	*Pavo cristatus/*phasianidae	Aves

Table 3 (continued)

Sl. no.	Local name of the animal	Common name	Scientific name/family	Class
51	Manuh	Human	*Homo sapiens*/hominidae	Mammalia
52	Ningani/Ningkara//Nigani/saru salia	Mouse	*Mus booduga*/muridae	Mammalia
53	Neul	Mongoose	*Herpestes edwardsii* /Herpestidae	Mammalia
54	Naipia	Java grass lizard	*Takydromus khasiensis*/lacertidae	Reptilia
55	Payntachura	Cockroach	*Periplaneta Americana*/blattidae	Insecta
56	Puthi mas	Swamp barb	*Puntius chola*/cyprinidae	Actinopterygii
57	Ruhit mas /Rau mas/Rupit mas	Rohu	*Labeo rohita*/cyprinidae	Actinopterygii
58	Rajhanh	Common swan	*Cygnus cygnus*/anatidae	Aves
59	Sag	Goat	*Capra hircus*/bovidae	Mammalia
60	Uluwaphesa	Grass owl	*Tyto longimembris*/tytonidae	Aves
61	Ud	Otter	*Lutra perspicillata*/mustelidae	Mammalia

Table 4 Total number of animals belonging to different classes involved in the treatment of diseases and deficiencies

Sl. no	Class	Nos. of animal
1	Reptilia	8
2	Insecta	8
3	Mammalia	21
4	Clitellata	1
5	Diplopoda	1
6	Aves	14
7	Actinopterygii	6
8	Gastropoda	2
	Grand total	61

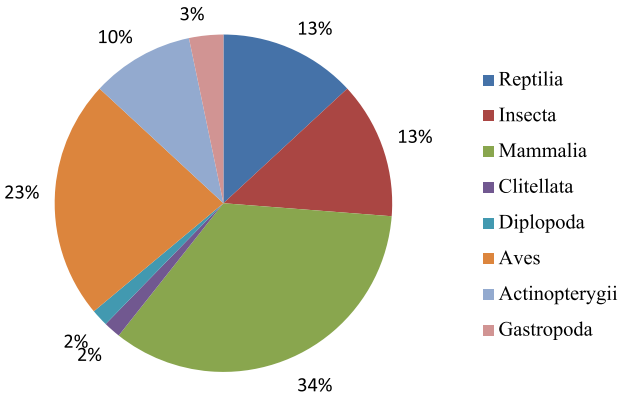

Fig. 5 Percentage of animal classes involved in the treatment of elephants

3 Conclusions

Documenting the traditional knowledge through ethnozoolgical studies is important for the conservation and utilization of biological resources. Fauna which are traditionally used by the people in the treatment of various desease of elephant have various medicinal properties. We have documented 61 ethnozoological animals which were used for the treatment of various diseases of elephants in medieval Assam. While studying the *hatiputhi* manuscripts, we learnt about the animals that were traditionally used to treat various diseases of elephants about 250 years ago. We have found a vast source of information about the diseases of elephants in these *hatiputhis*. Such indigenously prepared medicines using the organs of some animals except humans are still used in various places for different diseases of elephants. This study reveals about the animals that were known about 250 years ago and the ones today. This study will facilitate the easy identification and medicinal evaluation of animals mentioned in these manuscripts. The study showed the wide use of animal specie, their organs, body parts and products in the treatment of diseases and deficiencies of elephants. The ethnozoological medicinal knowledge provided by the *hatiputhis* is a valuable source to use animals as a potential source of developing drugs for different ailments.

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References

Ahmed, M. F., Das, A., & Dutta, S. K. (2009). *Amphibians and reptiles of Northeast India*. Aranyak Publisher.

Alves, R. R. N., & Rosa, I. L. (2013). *Traditional folk medicine: Implications for conservation*. Springer.

Asif, M. (Ed.). (2009). *Tarikh-e-Aasham by Shehabuddin Talesh*. Department of Historical and Antiquarian Studies.

Beal, S. (1884). *Si-Yu-Ki, Buddhist record of the western world* (Vol II, pp. 195, 199). Translated from the Chinese of Huen Tsang (AD 629). Trubner & Co, Ludgate Hill.

Betlu, A. L. S. (2013). Indigenous knowledge of zootherapeutic use among the Biate tribe of Dima Hasao District, Assam, Northeastern India. *Journal of Ethnobiology and Ethnomedicine, 9*, 1–15.

Bhuyan, S.K. (Ed.). (1990). *Deodhāi Asom Buranji*. Department of History and Antiquarian Studies, Government of Assam

Borah, M. P., & Prasad, S. B. (2016). Ethnozoological remedial uses by the indigenous inhabitants in adjoining areas of Pobitora wildlife sanctuary, Assam, India. *International Journal of Pharmacy and Pharmaceutical Sciences, 8*(4), 90–96.

Borkaith, S. (1734). Hastividyarnava. In P. C. Choudhury (Ed.), *Edited with an Introduction.* Publication Board, Assam.

Kakoti, L. N., Ao, B., & Doulo, B. (2006). Indegenous knowledge of zootherapeutic use of vertebrate origin by the Aoe tribe of Nagaland. *Journal of Human Ecology, 19*(3), 163–167.

Moran, D. (Ed.). (2007). *Hati chikar: Moran janagosthi in book moran matak samaj sanskriti*. Bengmora Prakashan.

Paul, S. (2018). Ethnozoological knowledge among missing tribes of Dhemaji, Assam. *International Journal of Engineering, Science and Mathematics, 7*(3), 53.

Rajkhowa, R. (2021). Hatiputhi: The medieval Assamese manuscripts on elephant training and treatment. *Indian Journal of History of Science, 56*, 230–234.

Saikia, R. R., & Bordoloi, M. (2015). *Bhāona Darpan* (p. 159). Assam Publishing Company.

Sarkar, A., Biswa, R., & Das, A. P. (2014). Zootherapeutic uses of animals by Mech tribe living in Duars of West Bengal, India. *Indian Journal of Traditional Knowledge, 13*(3), 557–563.

Sharma, P. V. (1998). *Caraka samhita, (English Version)* (4th ed.). Chaukhambha Orientalia.

Shepherd, C. R., & Nijman, V. (2008). *Elephant and ivory trade in Myanmar* (p. 3). Traffic Southeast Asia.

Verma, A. K., Prasad, S. B., Rongpi, T., & Arjun, J. (2014). Traditional healing with animals (zootherapy) by the major ethnic group of Karbi Anglong district of Assam, India. *International Journal of Pharmacy and Pharmaceutical Sciences, 6*, 1–8.